

WHAT HAPPENS WHEN A MODERN MAN OF WAR GOES INTO BATTLE.

A Naval Expert Describes the Preparations For Actual Conflict and the Battle.

The battleship in action is not an untold factor in modern warfare. We know something of its disastrous power in the hands of Chinese, even hampered by tampered ammunition and other consequences of official peculation. But just what to expect of a strictly modern battleship in the hands of either European or efficient Americans is something too momentous to predict.

A modern battleship is the most typical aggregation of all the fruits of present cunning, and the man that can utilize successfully all the powers placed there at his command will be able to deal such blows as only the most vivid imagination can begin to compass. Aided as we are by nature's working in the evidence of a thunderstorm, still the worst fury of lightning is modest beside the individual force of some of the guns carried by a modern battleship.

As the most formidable example of our commissioned battleships, let us see how we have prepared the Iowa to give and take, and try to follow in fact what might reasonably be expected of her in action.

Clothed in her peace time dress of white paint, one cannot imagine her a massive steel structure of something over 12,000 tons so lightly does she seem to rest upon the water, and, clothed in her white dress of paint, she seems to be even more deceptive. But wait till she is seen to lie unmoved upon a white-capped sea that makes her smaller than a rock, and then her ponderous might is realized. Think of the force within that must be generated to make her move along against wind and tide at the rate of 16 knots an hour, and then try, if possible, to picture the blow that would fall from the craft so unobtrusively as to lie across her rushing course.

The Iowa is really a navigable fortress 360 feet long, a trifle over 72 feet wide, and, omitting her smokestacks and bridges, is 30 feet tall from her keel up to the top of her superstructure amidships. Laden for sea, half of this body lies below the water line. That she may be comparatively insensible to moderate injury is evident, for she has a double or inner bottom reaching from the keel up to a short distance below the main deck, and the space between these two skins, so to speak, is minutely subdivided into numerous water-tight compartments to further localize injury. Her joints for a distance of quite ten feet on either side of the keel are guarded by a broad band of armor 7½ feet wide, about equally divided above and below the water line. Along the rest of the keel, the armor is 14 inches thick and proof against all the heaviest of an enemy's shell at very close range. The outerboard ends of the keel are protected by a sharp angle and terminate on the center line, where they form the main support for the ponderous barbettes that hold the 12-inch guns. This formation results in a massive hexagonal bulkhead of hardened steel, which presents a well nigh invulnerable front to shot or shell from any point of the bow, the stern or either of the sides. Upon this six-sided wall is laid the middle portion of the protective

deck 2½ inches thick, which houses over two-thirds of the ship. Below this deck, behind many feet of sheltering coal, so wisely is her supply of 1,800 tons distributed, and beneath the water line her engines, her boilers and her 370 tons of ammunition that await the coming of a foe worthy of their powder and hardened steel. From the lower edges of the armor belt inboard the protective deck, slightly thicker, runs forward and aft to the ends, and forms, at the bow of the spine for the ponderous ram which lies just far enough below water line to gore an enemy where he is weakest.

For a distance of 30 feet amidships and to a height of seven feet above the heavy water line belt the sides are armor five inches thick; and it is from behind the protecting shelter of this steel wall that the two torpedo tubes on each side are worked. The ends of this armor belt also turn constantly inboard and athwartships, and terminate likewise against the barbettes for the 12-inch guns. Forward and aft their lighter armor shields the sides are reinforced by a broad band of corn-pith cellulose, which will swell and automatically plug all shot holes admitting water.

The whole interior of the craft is cut up into something like 140 water-tight compartments, and powerful pumps of great capacity stand ready to hold in check the consequences of accident or leak. Woodwork is grudgingly allowed—ground cork and white paint standing instead for appearance and healthfulness, and such as is present, from the seaman's ditty-box to the admiral's easy chair, is fireproofed by a process of trichloride.

The fewest possible passages are cut through the protective deck; and, with the exceptions of the air passages to the engine rooms and fire rooms, and the gratings for the gun muzzles, are covered by heavy armored gratings to keep out shell. The rest of the openings are closed with solid coverings as heavy as the neighboring deck.

Heavy water-tight doors seal the passages between neighboring compartments, and offer a reasonable impediment to unnecessary intercommunication. Electric alarms guard against fire and the dangerous admission of water; and a steam steering gear, located in the engine room, controls the ship safe from the reach of a foe's main gun.

The main battery consists of four 12-inch and eight 8-inch rifles of great power. A secondary force of six four-inch and 20 six-pounder rapid-fire guns will guard against the approach of a smaller craft and sweep destructively the exposed positions and lightly armored parts of an enemy's fleet.

The 12-inch guns are mounted in two massive turrets of 15-inch Harveyized armor—the defensive equivalent of quite 20 inches of normal nickel steel. These turrets revolve within barbettes of great strength and like material, the thickness rising bodily from the protective deck below. Within this great bulk of hardened steel rest the foundations of the turret, and the turret itself is vital to the management of the turrets and the guns, and up through this sturdy passage are brought the powder and shot from the sheltered folds of the magazines and shell rooms way below.

Each of these guns weigh 45 tons as

it rests upon its carriage; has a total length of 38 feet, and a greater diameter of nearly 4 feet at the breech. The bore is rifled with 48 twisting grooves that bite into the copper band on the base of the projectiles, and give them that rapid rotation so essential to accuracy of flight and high power of penetration. With an impulse of 450 pounds of powder, the 350-pound shot of hardened steel goes speeding on its mission of destruction with an initial velocity of 2,100 feet a second—the equivalent of something over 1,400 miles an hour. With the greatest elevation permitted by the turret ports, 1, 6, 15 degrees, each of these guns has a range of quite 23 miles. Bombarding a city from that distance, the shot would reach its destination in a scant 24 seconds—three whole seconds in advance of the sound of the discharge that sent it. At the muzzle one of these guns could send an armor-piercing shot right through 24 inches of solid steel, and a mile and a half away the same kind of shot would go undeflected through 19 inches of the same kind of material. The destructive impulse latent in the shot as it leaves the gun is equivalent to the force required to raise one foot twice the total weight of the whole ship when heavily laden.

The 8-inch guns are protected by 5 and 8 inches of hardened metal, and fire 250-pound shot with force enough to pierce 12 inches of steel in a mile away. The 4-inch guns can fire eight 23-pound shots in a minute, easily able to bore their way through 1½ inches of steel 1,400 yards away; while the 20 six-pounders could maintain a murderous hail of explosive shell into open ports and upon the unarmored portions of a foe.

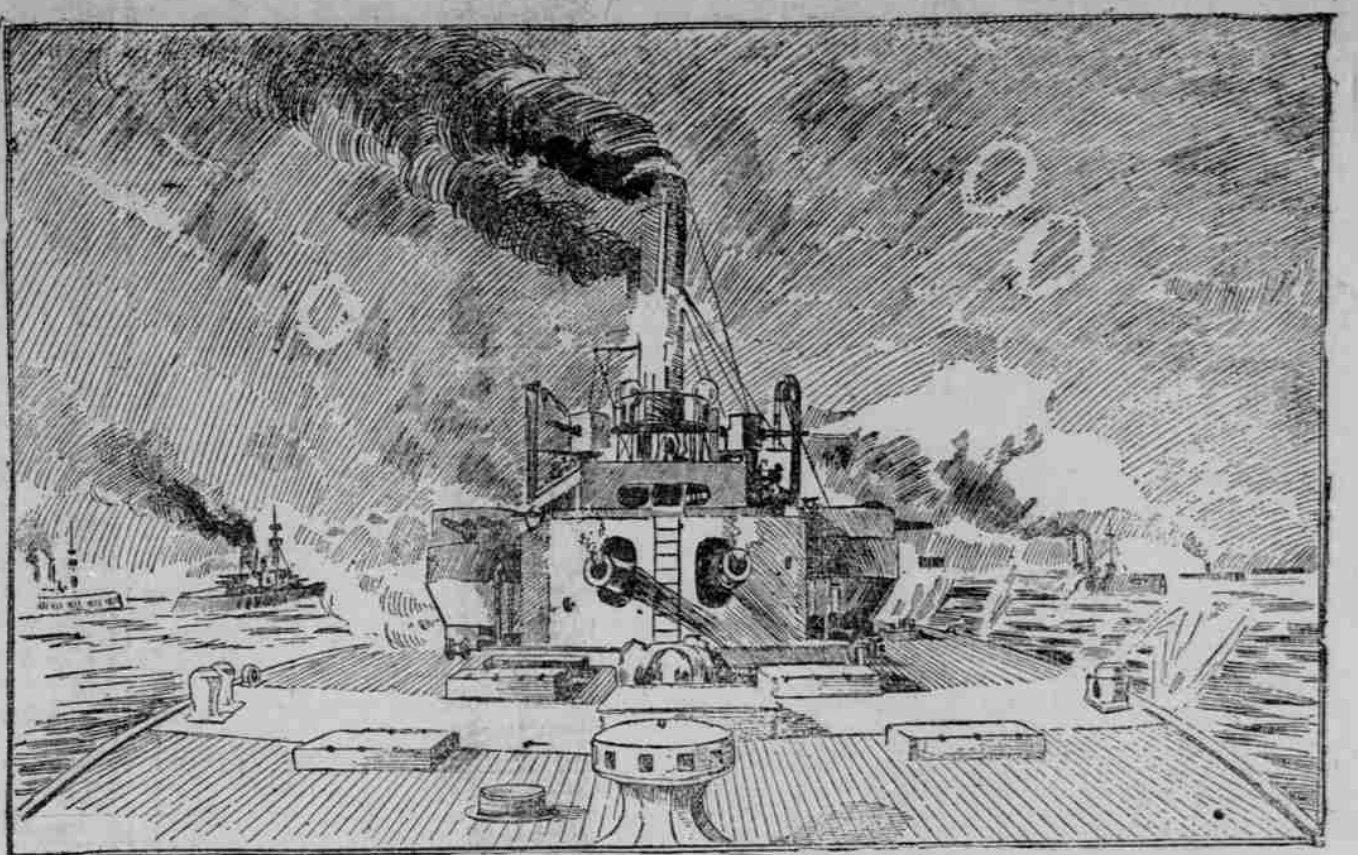
The torpedoes, each with its deadly burden of 150 pounds of that threefold powerful gun cotton, could tear their way through the toughest fabric of steel and make the mightiest battleship bow in submission.

These are some of the powers placed at the captain's command.

Take your watch in hand, and at the sharp, shrill call of the boatswain's whistle all hands are called to close ship for action, and scarcely before the last note has drifted off on the breeze, every man is at his post and the vessel except the chains, stretching lazily as they are turned out from the brig.

You who have known the craft in times of peace and dress parade, watch her now. Down come all the shining railings and polished half-way canopy frames, and over the open ways in the wake of the torpedoes are the main battery of heavy steel. All unnecessary ventilators are stored below, and their deck holes filled with metal disks. Great anchors are turned down out of the way of shot and shell, and the decks left bare but for the flash plates that take the first blast of the great guns. The anchors are freed from their cables, and the chains, if not stowed below, are wrapped for protection about unarmored parts.

Boat anchors are disengaged, and stowed either down below the sweep of the guns, all awnings are soaked with water, and other placed safely below to guard the ammunition supply from splinters and sparks, or awashed about such of the boats as are not filled with water or set adrift. Overboard go the stores, and all chests, furniture and other movable woodwork calculated to do bodily harm are removed or stowed below. Down below the protective deck are sent the compasses, chronometers and other delicate instruments of navigation, and the public funds are placed in such shape that they may be either easily removed or



AFTER DECK OF THE IOWA STRIPPED FOR ACTION.

destroyed, as the case may need. All needless steam supply is cut off above the protective deck, to prevent scalding in case of accident; and hose are coupled to fire mains and the pumps are set pulsing for instant use.

Look at the ship now. In just one hour and 30 minutes, she has been stripped to the waist, so to speak, and all her bulky lines stand out in bare coils, doubly emphasizing the might of her murderous guns now bearing straight out with an ominous absence of timidity. At the masthead, in unspooled beauty, flutters the proud folds of old glory.

A few short taps of the drum, and all hands hasten to their several stations—most of the men bared to the waist and taking their powder charge and projectile, their length and their penetration would have been considered outside the bounds of reason 30 years ago. The length of a 12-inch breech-loading rifle is 40 feet; its weight, 60½ tons; it carries a projectile weighing 1,100 pounds—more than half a ton—which can penetrate steel 24½ inches thick at a distance of 1,500 yards. It has a velocity at the muzzle of 2,100 feet a second, and a velocity of 1,800 feet at a distance of 2,500 yards, which is produced by the explosion of 550 pounds of brown prismatic powder, each grain of which is octagonal in shape and molded to an exact size. The cost of each discharge is about \$1,500. The range of a gun of 12 caliber is about 13 miles, or a mile to each inch, which is the approximate range of all guns.

A 12-inch gun is built to fire 250 shots before it loses its temper and becomes useless, except for old iron; but in most cases many more could probably be fired. The 1,200-pound projectile is almost as carefully made as the gun. It is of hard steel, with an armor-piercing point, and is fitted with copper bands which take against the rifling, and being of soft metal do not injure the delicate grooves of which there are 32.

Besides these monster cannon, the Washington navy yard produces small rapid fire ordnance of the Fletcher, Maxim, Driggs-Schroeder and Hotchkiss types, which are used aboard ship as a protection against torpedo boats, for landing parties, and for boat service. These weapons are much simpler in their construction than the heavy ordnance, but the same great care and thoroughness of workmanship characterize their building as the heavy ordnance.

A WAR INCIDENT.

Lincoln Once Threatened to Shoot Gen. Fitzhugh Lee.

Caldwell (Ria.) Record: The notoriety that General Lee is receiving through the Spanish trouble, called to Dr. W. C. Maxey's mind an incident that happened during the rebellion. It appears that our government had caused two rebel captains that were prisoners to be shot.

The confederate government decided to retaliate by shooting a like number of the same rank among the prisoners. One of the rebels was a General Lee, who was captured at Vicksburg. Maxey, who was then a prisoner, was ordered to shoot Lee. Maxey, however, refused to do so, and instead wrote a letter to his home in Pennsylvania, telling her that he was doomed to die on a certain day and requested her to come and see him. But instead of going directly to Richmond, she called on President Lincoln and stated the case to him. He immediately notified the confederate secretary of war that if Lee was shot, he would be promptly shot. The promise of the rebel officer saved the two Union soldiers, and also saved Lee, who now appears to be the right man in the right place. Dr. Maxey says that the captain of his company was an inmate of the prison when the war was drawn.

Not Up to Date.

Harper's Bazar: "Washington was a man of wonderful power. He seemed a tower of strength—a special gift of providence for his time," cried Hicks. "Let us go to the last point," said Dawson. "A man who can't lie is structurally lacking," my dear Hicks.

The Modern Way of It.

Pick-Me-Up: Algie—in the spring, you know, a young man's fancy lightly turns to thoughts of love. Mabel—Yes; he fancies he's in love.

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PREPARATIONS FOR WAR.

How the Work Is Rushed at Uncle Sam's Big Gun Factory.

In these days of preparation for war the Washington navy yard is one of the most interesting spots to be found anywhere. Strictly speaking, it is not a navy yard at all, but a gun factory. Here it is that all the heavy guns and most of the light landing and boat guns for the navy are built. The amount of work done in this great national factory is enormous, even in times of peace, but now that the lathes, engines and tools are running at full speed 24 hours out of 24, the number of guns and gun carriages turned out is nearly trebled.

Passing through the gate with its trim marine sentry post, to and fro the visitor sees uniformed officers hastening this way and that, busy with their duties, and hears on every side the dull rumble of machinery, the heavy thud of the trip-hammer, and the snorting of the steam cranes. A small army of draftsmen in the office are busily preparing plans and drawings for the use of the gun builders, and the civilian bosses and foremen of the shops are everywhere keeping watch with eagle eyes. There is a most responsible duty for every careless and incompetent workman with a single slip of his tool might spoil a gun or carriage which had cost the government thousands of dollars to put together.

The putting together or "assembling" of a modern gun is apparently a simple matter. But it is really one of the most delicate operations in the world. The greatest care and precision are necessary to make the different parts exactly fit, and one revolution too many of a plane or boring tool would injure the part beyond repair. Hence comes much of the fascination in watching the construction of one of the big guns as it grows in massive and polished beauty ready to take its place on one of our men-of-war.

First of all the tube of the piece comes to the factory from one of the big steel companies, the Bethlehem or the Midvale, which have the contracts to furnish forgings. The tube comes in the rough with only a core bored out, and looks like a heavy piece of steel pipe. For the four-inch gun it is 13 feet 7 inches long, while for the 12-inch gun it attains a length of 40 feet. This tube forms a basis for all future operations. A modern gun is built up by slipping upon a number of jackets and hoops, and shrinking them to a perfect adjustment. A 12-inch gun when finished, has 12 separate and distinct parts which have been assembled and fitted to the minutest fraction of an inch. As the caliber and size of the gun diminish, the number of parts is reduced, and the four-inch piece is composed of only five. In building up the gun the rough tube and the bands are first placed in lathes and carefully planed down to the dimensions required. The diameter of the interior of the jacket which is to slip over the tube half way its length, must correspond with mathematical exactness to the diameter of the tube's exterior, while the hoops, which in turn fit over this jacket, must be treated with a like precision. This work of planing is done in the great north gun shop, as it is known at the navy yard, and when it is completed, the tube and the bands have to be carried to the "shrinking pit" at the north end of the shop, where the next process is to be undergone. There are three heavy traveling cranes in the shop, of 110, 40 and 15 tons lifting power capacity respectively, and they pick up the huge pieces of iron and carry them to their destination as easily and lightly as if they weighed nothing at all. The "shrinking pit" is a deep hole sunk in the floor of the shop, and fitted

at each end with an oven. These ovens, in which the bands are to be expanded until they can slip over the gun tube, are heated by an air and oil blast to a temperature of 700 degrees Fahrenheit. For this degree of heat is necessary to expand the heavy jacket for the 12 and 12-inch guns. At the pit the tube is planted carefully on end close to the oven, in which is being heated the jacket which is to be received. Pipes are so arranged that a stream of water can be run continuously through the core of the tube, to keep it cool and prevent expansion by the heat as the hot jacket slips over it.

When all is ready, the men who are to perform the delicate task stand at attention. Each one of them has his own particular duty, and they are trained to act in concert, like a company of soldiers. The jacket has been placed in the oven and sealed up, to await expansion by the heat. The foreman gives the word, the traveling crane comes up and lifts off the hot lid of the oven, exposing the jacket within. The books are made fast to a clamp previously attached to the jacket, and the heated mass is lifted carefully from its fiery bed. The engineer of the crane watches, with hawk-like eyes, the signals of the foreman below, and when a sufficient height has been reached, the jacket is swung over the tube and lowered. Men with immense canvas mittens guide it as it comes down, and adjust it in place. When it has been slipped over the tube, streams of water are turned on to cool it. As it cools it shrinks back to its original size, and the delicate operation is complete.

Strange as it may seem, after coming through its fiery ordeal, the jacket hardly shows a sign of heat as it is lifted from the oven. There is a slight bluish tinge, and that is the only thing to distinguish it from the cold jacket which went in. The exterior of the tube and the interior of the jacket being exactly the same size, only the slightest expansion is required to make the slip over the other. From 3-100 to 5-100 of an inch is all that is allowed, even in the monster 12-inch guns. So the speediest and most accurate work is necessary after the jacket leaves the oven, for if the iron should cool off before it was in place, it would clamp at once upon the tube, and the gun would be ruined. A similar process is gone through with in slipping the smaller hoops over the jacket.

The shrinking of one part on another makes an absolutely perfect weld, and after once the bands are in place, nothing short of clipping it off piece by piece would remove it. The shrinking of the different bands of the piece having been finished, it is again put in the lathe and turned down to the required size, and the edges of the bands are beveled down to give it a neat appearance. It is then ready for the delicate operation of rifling.

Only the most experienced mechanics in the shop are in charge of the rifling machines, for on the perfection with which they perform their work the whole utility of the gun depends. The auger which cuts the grooves is carefully adjusted and lubricated, and the little hard steel chisel fitted on a long beam which runs through the bore of the gun commences their work. Only the smallest fraction of an inch is taken off at a time, and the greatest care is required in adjusting the auger exactly. When once put in position the lathe does the rest of the work by slowly turning the gun as the tool cuts its way through.

After being rifled the gun is placed on a car and carried to the breech mechanism shop, where the interrupted screw breech block, in use in nearly all the navies of the world, is fitted. The carriage with its recoil cylinders for taking up the "kick" of the piece when